Graduate Student Competition: ADSA Production Division Graduate Paper Competition–PhD Students

89 Hyperprolactinemia during late gestation increases milk yield from primiparous gilts and piglet growth. M. K. VanKlompenberg,* R. Manjarin, H. F. McMicking, and R. C. Hovey, *University of California, Davis.*

A major limitation for piglet growth and survival is maternal milk yield that is dependent on maximal mammary growth and optimal lactogenesis. Several lines of evidence point to prolactin (PRL) as being crucial for these processes in pigs, where a critical period during late gestation has been defined as being PRL-dependent. We hypothesized that administering a dopamine antagonist to induce hyperprolactinemia in primiparous gilts during late gestation would increase mammary growth, subsequent milk yield and piglet growth. A total of 19 Yorkshire/Hampshire gilts were assigned to receive either vehicle (VEH, n = 9) or domperidone (DOM, n = 10) twice daily from gestation (G) d90 to 110. Serial blood sampling during the treatment period and lactation, and subsequent radioimmunoassay confirmed that serum PRL levels were increased in treated animals at G91 ($P < 0.001$). Data were analyzed using a linear mixed model and *t*-test comparisons. Mammary gland biopsies were performed on d90, 100 and 110 of gestation and d 2 and 21 of lactation (L) to analyze various aspects of mammary gland growth. Piglets raised by DOM dams were 21% heavier than controls (4279 ± 341.0 g and 3533 ± 348.1 g, respectively; $P < 0.05$) at weaning (L21), having significantly greater average daily gains between L8 to 14 (234.7 ± 18.7 g/d, 195.0 ± 19.1 g/d; $P < 0.05$), and L15 to 21 (258.7 ± 18.7 g/d, 206.3 ± 19.1 g/d; $P < 0.01$). Milk production was measured using the weigh-suckle-weigh method on L2, 7, 14 and 21. Similar to piglet gain, milk production rate by DOM dams compared with controls was greater on L14 (30.7 ± 3.3 mL/h, 24.9 ± 3.3 mL/h; $P < 0.05$), and L21 (35.3 ± 3.3 mL/h, 26.9 ± 3.3 mL/h; $P < 0.01$). Taken together, these data indicate that pharmacologically induced hyperprolactinemia in primiparous gilts during late gestation leads to increased milk yield during established lactation that enhances piglet growth.

Key Words: mammary gland, milk production, prolactin

90 Photoperiod treatment during lactation alters organ weights but does not affect litter weight gain in mice. P. A. Bentley* and T. B. McFadden, *University of Alberta, Edmonton, Alberta, Canada.*

Manipulation of photoperiod is a well established method of enhancing milk production in dairy cows. Cows exposed to either short day photoperiod during the dry period or to long day photoperiod during lactation produce more milk. Photoperiod treatment is known to alter hormonal signaling and affect systemic immunity, both of which could be related to the milk yield response; however, definitive understanding of the underlying physiological mechanisms is lacking. The objectives were to determine the effects of different photoperiods on milk yield and weights of organs related to metabolic support of lactation or immune function in mice. Mice (n = 6 for each trt × time) were exposed to normal day length (12L:12D) during gestation and were then randomly allocated to long day (16L:8D), short day (8L:16D), or normal day length treatments from parturition through 15 d of lactation. Milk yield was estimated from litter weight gain and organs were weighed immediately after mice were euthanized. Data were analyzed using Proc GLM to test significance of main effects and interaction of photoperiod and time. Photoperiod had no effect on litter weight or litter weight gain/d. The main effect of photoperiod on dam weight was significant ($P < 0.03$), and dams on long day photoperiod weighed more ($P < 0.001$) on d 5 of lactation than those on short days. There was also an overall effect of photoperiod treatment on weight of dam's liver, normalized to body weight ($P < 0.01$), and d 15 liver weight was greater for dams on long days than on normal or short days ($P < 0.01$). Spleen weight was affected ($P < 0.02$) by photoperiod treatment, being greater in mice exposed to long days ($P < 0.01$). These data demonstrate that exposure of lactating mice to different photoperiods elicited physiological changes but did not affect milk yield. Increased weight of body, liver, and spleen of dams suggests that photoperiod may affect metabolic and immune function in mice, perhaps through mechanisms similar to those affecting mammary and immune function in dairy cows. Understanding of responses to photoperiod treatment in mice may help identify mechanisms of action in dairy cows.

Key Words: photoperiod, lactation, immune

91 Serotonin (5-HT) affects glucose metabolism in transition rats. J. Laporta,* T. L. Peters, K. E. Merriman, and L. L. Hernandez, *University of Wisconsin, Madison.*

The role of 5-HT in regulating processes such as milk synthesis and secretion have been defined. 5-HT has also been implicated in liver glucose homeostasis. 5-HT is synthesized in a 2-step reaction from the amino acid L-tryptophan (L-TRP). The rate-limiting step is catalyzed by tryptophan hydroxylase (TPH1) isoform to form 5-hydroxytryptophan (5-HTP), the immediate precursor to 5-HT. To explore 5-HT's role in glucose homeostasis during the transition period (9 d pre and postpartum) we fed 45 rats (n = 15 per-treatment) 3 diets: control (CON), 5HTP (0.2% total diet) and L-TRP (1.35% total diet) to increase endogenous 5-HT production. We measured daily milk yield (MY) and collected milk samples on d 1, 5 and 9 of lactation to measure lactose concentrations. We collected serum and plasma on d 20 of gestation and d 9 of lactation to measure circulating 5-HT and glucose levels. Total RNA was isolated from liver and mammary gland tissue and mRNAs for growth hormone receptor (GHR), pyruvate carboxylase (PC), phosphoenol pyruvate carboxykinase-1 (PEPCK1) in liver, and for glucose transporter-1 (GLUT1), PC and GHR in mammary gland were quantified by quantitative real time PCR. The 5-HTP and L-TRP treatments effectively increased serum 5-HT over time ($P < 0.001$), with a greater increase seen in the 5-HTP cohort. MY was the same among all cohorts, until d 8 and 9, in which it increased in L-TRP animals ($P < 0.05$). There were no significant differences in milk lactose levels between treatments ($P > 0.05$). Plasma glucose concentrations decreased from d 20 of gestation to d 9 of lactation in all cohorts, but more markedly in the L-TRP ($P < 0.001$). Liver GHR mRNA expression was decreased in both treatment cohorts ($P < 0.05$) while PC mRNA was increased only in the 5-HTP cohort ($P < 0.01$), however there were no significant changes in the mammary gland. Liver PEPCK1 was not affected while GLUT1 mRNA was greater in the mammary gland of both treatment groups when compared with CON group ($P < 0.05$). Feeding 5-HTP during the transition period increases 5-HT synthesis and appears to affect glucose homeostasis, and negatively affects GH's effects in the liver.

Key Words: 5-HT, liver, glucose

92 Inflammatory pathways contribute to the metabolic adaptations to lactation in dairy cattle. J. K. Farney*[1], L. K. Mamedova[1], J. F. Coetzee[2], B. KuKanich[1], L. M. Sordillo[3], J. E. Minton[1], L. C. Hollis[1], and B. J. Bradford[1], *[1]Kansas State University, Manhattan, [2]Iowa State University, Ames, [3]Michigan State University, East Lansing.*

Inflammation has been proposed as a contributor to metabolic disorders in transition dairy cows. The purpose of this experiment was to determine if a non-steroidal anti-inflammatory drug, sodium salicylate (SS), alters metabolism of transition dairy cows. At calving, 78 cows (n = 39 primiparous [1P]; n = 24 2nd lactation [2P]; n = 15 ≥ 3 lactations [3P]) were alternately assigned to either control (CON) or SS treatment for 7 d and remained on study until 21 d postpartum. SS treatment was administered via individual water bowls at a concentration of 1.68 g/L, delivering a mean of 123.3 ± 5.5 g SS/d during the 7 d of treatment. Blood samples were collected weekly and liver biopsies were collected on d 4 and 21 postpartum. Data were analyzed using mixed models with repeated measures over time and significance was declared at $P < 0.05$ and interactions were investigated at $P < 0.15$. There were no overall treatment effects on daily intake of water or DM, and SS treatment resulted in plasma salicylate concentrations of 34.4 ± 15.0 μg/mL on d 7. Liver TNFα mRNA abundance was decreased by SS on d 4 (28% reduction). Plasma glucose concentration was decreased by SS on d 7, especially in 2P and 3P cows (51.7 vs. 40.7 ± 3.1 mg/dL); 3P cows treated with SS had a 49% reduction in glucose-6-phosphatase mRNA on d 4 and a 81% reduction (d 21) in mRNA abundance of CREBH, a positive regulator of gluconeogenesis induced by inflammatory pathways. Plasma BHBA concentration was elevated in SS cows on d 14 and 21 (977 vs. 749 ± 56 μM), and plasma NEFA was elevated in SS cows on d 21 (525 vs. 377 ± 36 μM). SS treatment significantly increased liver triglyceride content on d 4 (29% increase) but by d 21 concentrations were similar across treatments. Because the most dramatic responses were observed in 3P cows, plasma samples from this block were analyzed for 14 eicosanoids. An index comprised of 11 pro-inflammatory eicosanoids showed no differences on d 7, but were significantly elevated for SS on d 14 (150% increase). Therefore, responses to SS after d 7 may have been due to altered metabolic programming or to post-SS increases in inflammatory signals. In summary, SS suppressed liver inflammation but decreased plasma glucose, increased plasma ketones, and contributed to liver triglyceride accumulation. These findings suggest that interrupting inflammation during the first week after parturition alters the metabolic adaptations to lactation.

Key Words: transition, inflammation, liver metabolism

93 Metabolism of butyrate infused in the rumen or abomasum of lactating dairy cows. K. J. Herrick*[1], A. R. Hippen[1], K. F. Kalscheur[1], D. J. Schingoethe[1], D. P. Casper[1], S. C. Moreland[2], and J. E. van Eys[2], *[1]South Dakota State University, Brookings, [2]Nutriad Inc., Elgin, IL.*

This research was to investigate the effects on plasma metabolites and rumen measures when butyrate was infused into the rumen or abomasum of lactating cows. Jugular catheters were inserted into 5 ruminally fistulated Holstein cows (94.2 ± 23.3 DIM; 717 ± 45 kg BW) in a 5 × 5 Latin square with 3-d periods. Cows were infused for 24 h with one of 5 treatments: water (CON), 1 g/kg BW of butyrate infused into either the abomasum (A1) or rumen (R1), or 2 g/kg BW of butyrate infused into either the abomasum (A2) or rumen (R2). Sodium butyrate was the source of butyrate and NaCl was added to the CON, A1, and R1 treatments to provide equal amounts of sodium as the 2 g treatments. Flanges were inserted into the abomasum to allow infusion to the abomasum and peristaltic pumps provided continuous infusion of all treatments. Serial blood samples were collected at −2, −1, 0, 0.5, 1, 2, 3, 4, 6, 8, 12, 18, and 24 h relative to starting dosing. Rumen fluid samples were collected at −2, −1, 0, 1, 2, 4, 6, 8, 12, 18, and 24 h relative to starting dosing. Area under the curve (AUC) was calculated using the pre-dosing values as a baseline. Average DMI and average production measures were not affected by treatment ($P < 0.05$). Plasma glucose (73.0, 67.2, 65.3, 69.6, and 62.1 mg/dl), plasma β-OHB (β-hydroxybutyrate) (615, 965, 1454, 676, and 1235 mM), and plasma butyrate (0.08, 0.09, 0.11, 0.10, and 0.15 mM) for the CON, R1, R2, A1 and A2 treatments were affected by butyrate addition and treatment dose ($P < 0.05$). The site of dosing affected ($P < 0.05$) plasma butyrate. Rumen butyrate (9.0, 15.3, 22.1, 9.4, and 9.7 mM) for the CON, R1, R2, A1 and A2 treatments respectively were affected by treatment, dosage, site of infusion, and interaction of site and dosage ($P < 0.05$). The AUC (44, −105, −342, −119, and −338 mg/dL • h) and the height of the largest peak for plasma glucose (−7.3, −12.2, −24.4, −12.8, and −25.6 mg/dL) and the AUC for rumen pH (−12.22, −8.15, −4.95, −10.60, and −6.58 pH • h) for CON, R1, R2, A1, and A2 were affected ($P < 0.05$) by butyrate addition and dose. Results demonstrate that butyrate infused into the rumen or abomasum decreases plasma glucose and increases plasma β-OHB.

Key Words: butyrate, infusion, ketone

94 Effect of breed on the metabolic profile in transition Holstein and Jersey dairy cows. K. J. Lager*[1,2], E. R. Jordan[1], R. G. S. Bruno[1,2], J. A. H. Rivera[3], A. M. Farias[3], R. Sprowls[4], and D. R. Topliff[2], *[1]Texas AgriLife Extension Service, Texas A&M System, College Station, [2]West Texas A&M University, Canyon, [3]Texas AgriLife Research, Stephenville, [4]Texas Veterinary Medical Diagnostic Laboratory, Amarillo.*

Significant advances in productivity have resulted due to genetic selection of Holstein and Jersey dairy cattle, as well as enhanced nutritional management. The objective of this study was to determine whether differences exist between the metabolic profile of Holstein and Jersey cows during the periparturient or transition period. Blood samples were collected from Holstein (n = 3658) and Jersey (n = 1699) cows within the transition period via coccygeal vessel venipuncture in nonheparinized vacuum tubes at morning feeding on 8 commercial dairies of each breed. Following centrifugation, samples were stored frozen (−20°C) in duplicate before laboratory analysis for calcium (Ca), phosphorus (P), magnesium (Mg), albumin, urea, glucose, cholesterol, sodium (Na), potassium (K), chloride (Cl), and nonesterified fatty acids (NEFA). Feed samples were collected on the day of sampling. Herd records were reviewed to identify data points from cows experiencing dystocia, retained placenta, displaced abomasum, twin births, stillbirths and cows being dry <30d or >80d and data were analyzed using multiple regression. The effect of breed was significant ($P < 0.001$) for all measured parameters exclusive of Na and cholesterol. Further, sampling week relative to calving was shown ($P < 0.001$) to affect P, Mg, Na, K, Cl, NEFA, glucose, and cholesterol, while number of lactations affected ($P < 0.05$) Ca, P, albumin, urea, glucose, cholesterol, and NEFA levels. Animal health is a factor in profile levels as animals experiencing one or more of the previously stated health incidences displayed differences ($P < 0.05$) in Ca, Mg, albumin, urea, cholesterol, K, and Cl but no difference in NEFA or glucose levels. These results suggest greater focus is necessary for the individual breeds if utilizing the metabolic profile as a diagnostic tool.

Key Words: dairy cow, metabolic profile, transition period

95 Effects of corn silage hybrids and quality of alfalfa hay on nitrogen metabolism and ruminal fermentation of early lactating dairy cows. M. S. Holt*[1], A. J. Young[1], J.-S. Eun[1], and K. E. Nestor[2], *[1]Department of Animal, Dairy, and Veterinary Sciences, Utah State University, Logan, [2]Mycogen Seeds, Indianapolis, IN.*

This experiment was conducted to determine the effects of corn silage (CS) hybrids and quality of alfalfa hay (AH) in high forage dairy diets on N metabolism and ruminal fermentation by early lactating dairy cows. Eight multiparous Holstein cows were used in a duplicated 4 × 4 Latin square experiment with a 2 × 2 factorial arrangement of treatments. The 8 cows (average days in milk = 23 ± 11.2) were surgically fitted with ruminal cannula, and the 2 squares were conducted simultaneously. Within square, cows were randomly assigned to a sequence of 4 diets during each of the 4 21-d periods (14 d of treatment adaptation and 7 d of data collection and sampling); conventional CS (CCS) or brown midrib CS (BMRCS) was combined with low quality AH (LQAH: 46.4% NDF and 18.7% CP) or high quality AH (HQAH: 37.4% NDF and 21.8% CP) to form 4 treatments: CCS with LQAH, CCS with HQAH, BMRCS with LQAH, and BMRCS with HQAH. Diets were isonitrogenous across treatments averaging 15.8% CP. Intake of DM did not differ because of CS hybrids and AH quality. While feeding BMRCS-based diets decreased urinary N output by 32% ($P < 0.01$), it did not affect fecal N output. Feeding HQAH decreased urinary N output by 18% ($P = 0.01$), but increased fecal N output by 14.5% ($P = 0.01$). Nitrogen efficiency (milk N (g/d)/intake N (g/d)) was similar across treatments. Ruminal ammonia-N concentration was lower for cows fed BMRCS-based diets than those fed CCS-based diets ($P = 0.02$), but was not affected by quality of AH. Feeding BMRCS-based diets decreased MUN concentration and yield by 23% ($P < 0.01$), whereas feeding HQAH decreased MUN concentration and yield by 15% ($P < 0.02$). Total VFA concentration increased with HQAH ($P = 0.02$), but was not influenced by CS hybrids. Milk yield did not differ due to CS hybrids, but it tended to decrease ($P = 0.08$) by feeding HQAH. Significantly decreased MUN by feeding BMRCS or HQAH suggests improved whole-body N utilization efficiency.

Key Words: brown midrib corn silage, alfalfa hay, nitrogen efficiency

96 Effects of partial replacement of dietary starch from barley or corn with lactose on the performance of dairy cows. G. E. Chibisa*[1], G. B. Penner[1], P. Gorka[1], R. Berthiaume[2], and T. Mutsvangwa[1], *[1]Department of Animal and Poultry Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada, [2]Dairy and Swine Research and Development Centre, Agriculture and Agri-Food Canada, Sherbrooke, Quebec, Canada.*

Sugars are more rapidly fermented in the rumen than starch, and replacing dietary starch with sucrose in corn/alfalfa silage-based diets has been reported to improve milk production in dairy cows. Few studies have used lactose as a partial replacement of starch from barley or corn, which differ in their rates and extents of ruminal fermentation. The objective of this study was to determine the effects of replacing barley or corn starch with lactose (as dried whey permeate; DWP) on DMI, milk yield and composition, ruminal pH, and blood metabolites. Eight lactating dairy cows were used in a replicated 4 × 4 Latin square design with 28-d periods (18 d of dietary adaptation and 10 d of measurements) and a 2 × 2 factorial arrangement of dietary treatments. Four cows in one Latin square were ruminally-cannulated for the measurement of ruminal fermentation characteristics. The treatment factors were source of starch (barley vs. corn) and dietary inclusion level of DWP (0 vs. 6%, DM basis) as a partial replacement for starch. Diets were isonitrogenous (18% CP) and contained 3% (low) or 8% (high) sugar. The starch content of the low sugar diets was 24% compared with 20% for the high sugar diets. Dry matter intake, milk composition, milk and milk component yields, and blood glucose and β-hydroxybutyrate concentrations did not differ ($P > 0.05$) with diet. The daily mean and maximum pH were similar ($P > 0.05$) across diets. However, minimum pH tended to be lower ($P = 0.07$) when feeding barley compared with corn. The duration (h/d) that ruminal pH was below pH 5.8 also tended to be shorter ($P = 0.06$) whereas the area (pH × min/d) that pH was below pH 5.8 was smaller ($P = 0.04$) on the corn diet compared with the barley diet (47 vs. 111). Cows fed 6% DWP had lower ruminal ammonia ($P = 0.04$; 11.2 vs. 14.0 mg/dL) and milk urea nitrogen concentrations ($P < 0.01$; 16.5 vs. 17.8 mg/dL) and tended to have lower blood urea nitrogen ($P = 0.07$) compared with those fed 0% DWP. In conclusion, partially replacing corn or barley starch with DWP improved N efficiency, but had no effect on production and ruminal pH in dairy cows.

Key Words: lactation performance, lactose, starch

97 In search of privacy: Dairy cow preference for an isolated calving area. K. L. Proudfoot,* D. M. Weary, and M. A. G. von Keyserlingk, *University of British Columbia, Vancouver, British Columbia, Canada.*

When dairy cows are housed in semi-natural environments, they distance themselves from the herd to calve. Indoor-housed cows have limited ability to isolate from the herd, as many are housed in group pens or in individual pens located in high traffic areas. The aim of this study was to assess whether indoor-housed cows would seek isolation to calve if given a choice, and if this choice was influenced by the time of day and the number of cows in the pen. Seventy-two Holstein dairy cows (50 multiparous; 22 primiparous) were paired by calving date. At 6.6 ± 3.0d before calving, each pair entered one of 4 maternity pens. Each pen included an "open" sawdust pack (2.4 × 7.3m) and an "enclosed" sawdust pack (2.4 × 6m); the enclosed pack was surrounded by 2.4m high plywood walls on 3 sides, the fourth side had a 2.4m opening that allowed cows to freely enter or exit the enclosure. Once the first cow of a pair calved she was removed; the second cow remained single-housed in the pen until she calved. We used video to assess the time and area where calving took place. The probability that pair- and single-housed cows would calve in the open or enclosed pack, and during the 'day' (08:00 to 21:00 h) or 'night' (21:00 to 08:00 h), was assessed using Chi-Square tests. We noted no differences between primiparous and multiparous cows, so tests were done using a combined data set. Pair-housed cows were more likely to calve in the open pack, whereas single-housed cows were more likely to calve in the enclosed pack (Chi-Square = 4.5; $P = 0.03$). Choice of calving area was contingent on the time of day for single-housed cows (Chi-Square = 7.5; $P = 0.01$) but not for pair-housed (Chi-Square = 0.2; $P = 0.67$). Single-housed cows that calved at night were more likely to calve in the open, but cows that calved during the day were more likely to be in the enclosed area. Results suggest that isolation-seeking at calving is contingent on time of day and the number of cows in the pen.

Key Words: transition, housing, maternity

98 II. Identifying within-herd risk factors affecting reproductive performance of lactating dairy cows under field conditions. S. Bas*[1], R. L. Nebel[2], and G. M. Schuenemann[1], [1]*Department of Veterinary Preventive Medicine, The Ohio State University, Columbus,* [2]*Select Sires Inc., Plain City, OH.*

Many factors influence the reproductive performance of dairy herds, thus, profitability. Successful identification of factors affecting pregnancy rate (PR) at herd level can be challenging due to their multi-factorial nature. The objective was to assess the effectiveness of an interactive dairy herd index (DI) to aid in decision making about reproductive management of dairy cows. Data from one dairy herd, previously assisted to improve PR, was used to validate the DI. Risk factors [stillbirth, retained fetal membranes (RFM), metritis, mastitis, lameness, body condition score (BCS), estrus detection (ED), conception risk (CR), labor-cow ratio, and stocking density] were assessed according to their contribution weights (CW) on PR. Data from previous studies were used to estimate the CW using linear regression. Additionally, risk factors (one yr before and after intervention) were compared with desired reference values to obtain the relative difference for individual DI by components and ranking of risk factors. According to the DI, stocking density, metritis, lameness, and stillbirth were the top 4 risk factors explaining PR before intervention. These risk factors were in agreement with findings collected during the herd walk-through. Recommendations were close-up pen for dry cows; 85% stocking density for close-up and fresh cows; comprehensive training (calving management and hoof trimming) to dairy personnel; and no changes were made on nutrition and reproductive management. After intervention, the relative difference (change of risk factor values) was improved for stillbirth (45%), lameness (46%), metritis (33%), stocking density (13%), and mastitis (13%). No changes were observed for RFM (0%), BCS (0%), and labor-cow ratio (0%) while the relative differences for ED (3%) and CR (6%) were decreased after intervention. Dairymen, consultants, and veterinarians often trouble-shoot poor PR in dairy herds and this process requires constant monitoring and comprehensive assessment of several events. Risk factors affecting PR varies from farm-to-farm and blanket recommendations often fail when applied to many herds. This DI may assist decision makers to focus on real within-herd risk factors accounting for the effect of management.

Key Words: index, pregnancy, dairy cow

99 Efficacy of a combination butaphosphan and cyanocobalamin product and insulin for ketosis treatment. J. L. Gordon*[1], S. J. LeBlanc[1], L. Neuder[2], T. H. Herdt[2], D. F. Kelton[1], and T. F. Duffield[1], [1]*University of Guelph, Guelph, ON, Canada,* [2]*Michigan State University, East Lansing.*

Ketosis is a common transition disease in dairy cattle and can be challenging to treat. The objective of this study was to determine the efficacy of a combination butaphosphan and cyanocobalamin product (B+C; Catosal, Bayer) and insulin on ketosis cure rates and β-hydroxybutyrate (BHBA) concentrations. A double blind randomized clinical trial was performed in 16 herds in Ontario and 1 herd in Michigan from May to September 2011. All cows were tested for BHBA twice, at 3–9 and 10–16 d in milk (DIM) using the Precision Xtra meter (Abbott Laboratories). Cows that tested ≥ 1.2 mmol/L were considered to have ketosis. A total of 629 animals were enrolled and all received 300 g propylene glycol orally for 3 d. Animals were randomly allocated to receive additional treatment in a 2 × 2 factorial design with 199 cows receiving 200 IU (2 mL) insulin glargine (IG; Lantus, Sanofi-Aventis,) and 25 mL saline subcutaneously (SQ), 115 cows receiving 25 mL B+C and 2 mL saline SQ, 108 cows receiving 25 mL B+C and 200 IU IG, and 207 cows receiving both placebos. B+C or corresponding placebo was given for 3 d total. BHBA was measured at 7 and 14 d after treatment. An animal was categorized as a cure if d 7 BHBA was < 1.2 mmol/L. Logistic regression was used to determine the effect of treatment on cure rates and linear regression was used to examine the effect on d 7 post-treatment BHBA controlling for farm, lactation, and enrollment BHBA. Due a temporarily unavailability of B+C, only the 371 cows from Michigan were used for this analysis. All cows were used to analyze the effects of insulin. B+C tended to increase cure rates (OR = 1.5, 95% CI: 0.99–2.29, $P = 0.08$) and decrease d 7 post-treatment BHBA (−0.19 mmol/L, $P = 0.07$). Insulin was not significantly associated with cure (OR = 0.98, $P = 0.93$) or 7-d post-treatment BHBA (−0.07 mmol/L, $P = 0.91$). There was no interaction between B+C and IG. These results suggest that B+C treatment given with oral PG may improve ketosis cure rates, while IG is not helpful.

Key Words: ketosis treatment, insulin, cyanocobalamin

100 Ecology of subclinical ketosis in transition dairy cattle. J. A. A. McArt*[1], D. V. Nydam[1], and G. R. Oetzel[2], [1]*Cornell University, Department of Population Medicine and Diagnostic Science, Ithaca, NY,* [2]*School of Veterinary Medicine, University of Wisconsin, Madison.*

The purpose was to describe the ecology of subclinical ketosis (SCK) in dairy cows in early lactation and to determine the effect of: 1) presence of SCK, 2) d in milk (DIM) at onset of SCK, and 3) blood β-hydroxybutyrate (BHBA) concentration at onset of SCK on development of displaced abomasum (DA) and removal from herd in the first 30 DIM, conception to first service, d to conception within 150 DIM, and early lactation milk yield. Cows from 4 free-stall dairy herds were each tested 6 times for SCK from 3 to 16 DIM using the Precision Xtra meter. SCK was defined as a BHBA concentration of 1.2 to 2.9 mmol/L. Mixed effects multivariable Poisson regression was used to assess DA, removal from herd, and conception to first service. Semiparametric proportional hazards models were used to evaluate d to conception, and repeated measures ANOVA was used to evaluate milk yield in the first 30 DIM. A total of 741 of 1,717 (43.2%) eligible cows had a least one BHBA test of 1.2 to 2.9 mmol/L. Peak incidence of SCK occurred at 5 DIM when 22.3% of cows had their first SCK positive test. Peak prevalence of SCK occurred at 5 DIM when 28.9% of cows had a SCK positive test. Median time from first positive SCK test until BHBA test <1.2 mmol/L was 5 d. Cows first testing SCK positive from 3 to 5 DIM were 6.1 times more likely (95% confidence interval (CI) = 2.3 to 16.0) to develop a DA than cows first testing SCK positive at 6 DIM or later. Cows first testing SCK positive from 3 to 7 DIM were 4.5 times more likely (95% CI = 1.7 to 11.7) to be removed from the herd, 0.7 times as likely (95% CI = 0.6 to 0.8) to conceive to first service, and made 2.2 kg less milk per day for the first 30 DIM than cows first testing SCK positive at 8 DIM or later. Each 0.1 mmol/L increase in BHBA at first SCK positive test raised the risk of developing a DA by a factor of 1.1 (95% CI = 1.0 to 1.2), raised the risk of removal from herd by a factor of 1.4 (95% CI = 1.1 to 1.8), and was associated with a decrease in milk production by 0.5 kg per day for the first 30 DIM. These results show that time of onset and BHBA concentration of first SCK positive test are important indicators of individual cow performance.

Key Words: ketosis, incidence, prevalence